

tion, environment **100** is depicted as a transit station—e.g., train or subway station. Based on the description herein, other types of environments are applicable to the disclosed embodiments and are within the spirit and scope of the present disclosure.

FIG. **1** depicts electronic devices **101-104**, a stationary merchant terminal **130**, a mobile merchant terminal **132**, transit gate terminals **140A-C**, radios **110A-D**, and a location server **120**. In some embodiments, any or all of electronic devices **101-104** can be a mobile electronic device such as, for example, a smart phone, a tablet computer, a wearable device, a laptop computer, a human interface device, etc. Electronic devices **101-104** may be configured to communicate with other electronic devices using various wireless communication protocols, such as Wi-Fi, Bluetooth, radio-frequency identification (RFID), near field communications (NFC), 60 GHz communications, cellular communication, or any combination thereof. Any or all of electronic devices **101-104** may be equipped with a global positioning system (GPS) radio. In some embodiments, any or all of electronic devices **101-104** may also be equipped with an ultra-wideband (UWB) radio configured to communicate with any or all of radios **110A-D**.

Electronic devices **101-104** may perform wireless, electronic transactions using one or more credentials (or virtual credentials) associated with a respective electronic device, according to some embodiments. One or more of the credentials can be associated with an account, such as a transit account or a credit/debit account. One or more other credentials can be stored-value (or truth-on-card or actual cash value) credentials that retain an actual financial value on the card, such as a transit card or pre-paid card. Financial information such as, for example, credit card information and/or transit station card information may be stored on one or more of electronic devices **101-104**. This information may be represented as one or more virtual credentials or “virtual payment cards” in electronic devices **101-104**—analogous to physical cards in a wallet—and used by electronic devices **101-104** to conduct transactions. Electronic devices **101-104** may use any number of wireless communication means to perform transactions, including with any/all of stationary merchant terminal **130**, mobile merchant terminal **132**, and transit gate terminals **140A-C**.

In referring to FIG. **1**, each of stationary merchant terminal **130** and mobile merchant terminal **132** may be, for example, a Europay, MasterCard, Visa (EMV) terminal associated with one or more merchants, according to some embodiments. In other embodiments, one or more other types of terminal may be used. Transit gate terminals **140A-C** may be turnstiles that serve as gatekeepers into, for example, a transit platform area (e.g., platform area for a train or subway). Stationary merchant terminal **130**, mobile merchant terminal **132**, and transit gate terminals **140A-C** may be equipped with hardware to enable wireless communications with electronic devices **101-104** based on, for example, an NFC protocol, according to some embodiments. Further, each of radios **110A-D** can be a UWB radio.

FIG. **1** depicts different example scenarios in which one or more of electronic devices **101-104** perform transactions with one or more of stationary merchant terminal **130**, mobile merchant terminal **132**, and/or transit gate terminals **140A-C**. As depicted in the example of FIG. **1**, electronic device **101** may be outside the range of stationary merchant terminal **130**, mobile merchant terminal **132**, and transit gate terminals **140A-C**, such that electronic device **101** cannot perform a transaction with any of these terminals. Electronic device **102** may be near stationary merchant terminal **130**.

Electronic device **104** and mobile merchant terminal **132** may move towards each other to perform a transaction via, for example, an NFC connection. Electronic device **103** may be near transit gate terminal **140B**, in which electronic device **103** (and associated user) may seek to enter the transit platform through transit gate terminal **140B**. In some embodiments, electronic devices **102-104** may use different virtual payment cards (or other credentials) to perform transactions with their corresponding nearby terminals. For example, electronic devices **102** and **104** may use virtual payment cards associated with different banks to perform transactions with stationary merchant terminal **130** and mobile merchant terminal **132**, respectively. And, electronic device **103** may use a virtual prepaid “smart card” that is compatible with transit gate terminals **140B**. In other implementations, any credential compatible with a merchant system may be used for a transaction.

In some embodiments, electronic devices **102-104** may automatically select an appropriate credential (e.g., virtual payment card) based on their distance from their respective terminals and their knowledge of the type of terminal. The distance between electronic devices **102-104** and their respective terminals can be determined using radios **110A-D**, which can be UWB radios according to some embodiments (radios **110A-D** are also referred to herein as “UWB radios **110A-D**”). In some embodiments, UWB radios **110A-D** may be communicatively connected to location server **120**.

Electronic devices **101-104** may engage in a “ranging” operation (or alternatively “secure ranging” operation) with UWB radios **110A-D**. In some embodiments, the ranging operation allows UWB radios **110A-D** to determine the distance between UWB radios **110A-D** and an electronic device, such as any/all of electronic devices **101-104**. The ranging operation will be described in greater detail below. In an example, one or more of UWB radios **110A-D** can determine their respective distances from electronic device **102** and provide the respective distances to location server **120**. Location server **120** can use a triangulation (or trilateration) method to determine a relative location of electronic device **102** within environment **100**, according to some embodiments. Location server **120** can communicate the relative location to electronic device **102** via a wireless radio **122**. Those skilled in the relevant art(s) will appreciate that wireless radio **122** may be configured to communicate the relative location to electronic device **102** using any wireless protocol, such as any/all of Wi-Fi, Bluetooth, or a cellular communication standard (e.g., UMTS, CDMA, or LTE standards). In some embodiments, wireless radio **122** may utilize “small cell” or “distributed antennae system” deployments to allow location server **120** to communicate with electronic devices **101-104** throughout environment **100**. Alternatively, in some embodiments, any or all of UWB radios **110A-D** can be used by location server **120** to communicate the relative location to electronic device **102**.

If a terminal is stationary (e.g., stationary merchant terminal **130** or any one of transit gate terminals **140A-C**), either electronic devices **101-104** or location server **120** may determine the distance between the electronic device and terminal, according to some embodiments. In some embodiments, if a terminal is mobile (e.g., mobile merchant terminal **132**), the mobile terminal may perform ranging operations with one or more UWB radios **110A-D** to determine the mobile terminal’s relative location within environment **100**. Location server **120** can send the mobile terminal’s location to electronic devices **101-104**, according to some embodiments. Any one of electronic devices **101-104** may